



vii. ENERGY SOURCE

The sleeve gun array source incorporates a new concept in airgun design in that the shuttle is an external sleeve that produces a full 360 degree port. This allows a more efficient acoustical pulse than the traditional airgun.

Three chambers control the movement of the shuttle. These are the air spring return chamber, the firing chamber and the main chamber.

The air spring chamber is constantly fed by the air supply through the fill passage. It's purpose is twofold: first, it holds the shuttle closed when the gun is not firing and second, it provides a spring return, or recoil, to return the shuttle to its closed position.

The firing chamber controls the firing of the airgun. It is fed by a solenoid valve which is normally in the closed position. When an electrical pulse is sent to the solenoid valve the valve opens and supplies air to the firing chamber. This creates a force imbalance that opens the shuttle. Once the shuttle is completely open, small exhaust ports in the firing chamber dump the air pressure. Once this chamber and the main chamber have exhausted the shuttle returns to the closed position.

The main air chamber is exhausted very rapidly to create an explosion or acoustic blast. This chamber also contributes a majority of the opening force on the shuttle, causing the shuttle to open quickly. As soon as the firing chamber has moved the shuttle far enough to break the face seal between the shuttle and the chamber sleeve, the high pressure air rushes under the shuttle flange, thus exposing a much greater area to the chamber pressure. This is by far the greatest force acting on the shuttle.

After the shuttle has opened fully, there is no longer any pressure in the main chamber or the firing chamber. The pressure in the air spring chamber is sufficient to close the shuttle.

To ensure accurate timing, the sleeve gun incorporates a ring of magnets in the top of the shuttle. As the shuttle moves towards the timing coil, located in the cap of the gun, an electrical pulse is generated. This pulse is sent to the Texas Instruments Airgun Controllers where precise timing of each individual gun is controlled.